



BRETT LITTLETON

NITROGEN

Element Symbol: **N**

Atomic Number: **7**

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Nitrogen is perhaps one of the most readily recognised elements, yet its importance is often understated.

Nitrogen is abundant on the earth – constituting ~78% of the air we breathe. Yet the form it takes in the atmosphere as molecular dinitrogen (N_2) is highly inert, and unable to be chemically manipulated by most organisms. Mankind's synthetic manipulations of dinitrogen have been equally difficult, yet due to its importance to life and agriculture, mankind has persisted in its attempts to convert N_2 to usable forms (predominantly to nitrate for fertilizers), and to this end, 1% of the entire world's energy use is dedicated to chemically manipulating N_2 . Nature carries out the same nitrogen chemistry using bacteria associated with legumes.

Nitrogen is vital to all currently known forms of life – present in amino acids and hence in proteins and our DNA. In various molecular guises, nitrogen also has many other important uses including:

- Explosives: Nitrogen is the key element in many explosives. E.g. TNT, gun cotton (nitro cellulose), nitroglycerine.
- Rocket fuels: Nitrogen compounds are used both as the fuel (hydrazine) and the oxidiser (nitrogen tetroxide) in many rocket engines.
- Healthcare: Nitrogen compounds have long been associated with medicine. Nitrogen is a key to relieving pain - from 'laughing gas' (nitrous oxide) to opiates such as morphine. All the major classes of antibiotics also contain nitrogen.
- Beer: Nitrogen is the preferred pressurizing agent for many beers – most notably in stouts and ales. The “widgets” in cans of stout contain nitrogen.
- Cryogenics: Liquid nitrogen ($-196\text{ }^{\circ}\text{C}$) is used extensively to cool a wide range of materials – from biological materials to foods.
- Smog: Not all uses of nitrogen are beneficial – nitrogen oxides are formed in engines and are a principal component of smog.
- Poisons: In the wrong form, nitrogen can also be lethal – it is found in many toxic compounds such as cyanide and azides.

Provided by the element sponsor Damien Stringer

ARTISTS DESCRIPTION

Nitrogen occurs in all living organisms.

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